10/510102
DT04 Rec'd PCT/PTO 0 5 OCT 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of

Chi-Duc NGUYEN

Corres. to PCT/EP03/03771

For: HEAT EXCHANGER, ESPECIALLY A HEAT EXCHANGING MODULE, FOR A MOTOR VEHICLE

VERIFICATION OF A TRANSLATION

Commissioner for Patents,
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I, Susan ANTHONY BA, ACIS,

Director of RWS Group Ltd, of Europa House, Marsham Way, Gerrards Cross, Buckinghamshire, England declare:

That the translator responsible for the attached translation is knowledgeable in the German language in which the below identified international application was filed, and that, to the best of RWS Group Ltd knowledge and belief, the English translation of the international application No. PCT/EP03/03771 is a true, faithful and exact translation of the corresponding German language paper.

I further declare that all the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of legal decisions of any nature based on them

Date: September 13, 2004

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Heat exchanger, in particular heat exchanger module, for a motor vehicle

The invention relates to a heat exchanger, in particular a heat exchanger module, for a motor vehicle, according to the preamble of claim 1.

In heat exchangers in the form of a heat exchanger module, that is to say in which the condenser and the coolant cooler are connected to one another as a unit via corrugated ribs and side parts, temperature changes and associated periodically different temperature levels in the heat exchanger and coolant cooler result, due to the different thermal expansion states, in stresses which may lead to leaks. Furthermore, the temperature changes and the associated stress changes load the formed tube ends of the flat tubes of the heat exchanger module, and this may lead, here too to leaks.

For this reason, in conventional heat exchangers, expansion beads in the side part are provided, as illustrated, for example, in fig. 3 in the region identified by a circle. The production of expansion beads of this type requires special forming tools and an additional consumption of material as a result of the shaped-out beads.

The object of the invention is to improve a heat exchanger of this type.

This object is achieved by means of a heat exchanger having the features of claim 1.

According to the invention, a heat exchanger for a motor vehicle with a heat exchanger module is provided, which has a side part with at least one predetermined breaking point. In this case, the predetermined

breaking point lies preferably in the region of the tube forming or at an interface between the condenser part (in particular, flat-tube condenser) and the coolant cooling part (in particular, coolant cooler) of the heat exchanger module.

Preferably, the predetermined breaking point is formed by webs, in particular by three webs, which are separated from one another by means of cutouts arranged in a V-shaped manner.

Preferably, the webs have a width of 0.5 to 2 mm, in particular 1 to 1.5 mm, with the result that the predetermined breaking point breaks even under relatively low loads and the flat tubes of the heat exchanger are protected.

Preferably, the heat exchanger is designed in such a way that a marginal region of the side part is bent through approximately 90° along the longitudinal edge of the side part and is interrupted in the region of the predetermined breaking point by cutouts.

Preferably, the webs are delimited laterally by cutouts, at least one of which is of angular design in the direction of the webs, in particular with an angle of 90° or less, that is to say is sharp-edged.

The invention is explained in detail below by means of an exemplary embodiment, with reference to the drawing in which:

fig. 1 shows a perspective illustration of a side part of a heat exchanger module;

fig. 2 shows a top view of an end region of the side part of fig. 1; and

fig. 3 shows a perspective illustration of a side part of a heat exchange module according to the prior art.

A heat exchanger according to the invention, in the form of a soldered all-aluminum heat exchanger module, has a flat-tube condenser, a coolant cooler, which comprise a plurality of flat tubes and corrugated ribs connected to one another in the manner of a net structure, and two side parts 1 which are located opposite one another and one of which is illustrated in figs. 1 and 2.

Reference is made below to fig. 2, the configuration of the side parts 1 being essentially symmetrical at both ends. The side part 1, a bent sheet aluminum part, has a marginal region 2 running essentially around the entire side part 1 and bent to approximately 90° upward, that is to say away from the flat-tube condenser and coolant cooler. The marginal region 2 is interrupted, in an end region 3 of the side part 1, by two cutouts 4 which are arranged on the two longitudinal sides of the side part 1 and which have two edges 5 and 5'. In this case, the edge arranged further away from the end region 3 is designated by 5 and the edge lying nearer to the end region 3 is designated by 5'. In each case, formed approximately symmetrically, a cutout 6 running inward obliquely to the longitudinal axis of the side part 1 is provided, spaced apart somewhat from the edge 5, so that the two cutouts 6 are arranged in a V-shaped manner. The end region 3 and the middle region of the side part 1 are connected to one another by means of three webs 7. The webs 7 have a width of approximately 1.5 to 2 mm and form a predetermined breaking point 8. In this case, the cutouts 4 and 6 are arranged in such a way that in each case at least one sharp-edged corner region of the cutouts 4 and 6 delimits a web 7, so that a high notch

effect is achieved and, as a result, the predetermined breaking point 8 breaks even under relatively low stresses. This occurs particularly in the event of a temperature change, as a result of which the coolant flat tubes expand in the direction of the block height, that is to say in the longitudinal direction of the side part, and said stress thereby arises on the side part and leads to a predetermined break, with the result that the coolant flat tubes are relieved of load. In this case, the side part is highly stable in the direction of the block width, so that the predetermined breaking point has no influence on the tensioning (cassetting) of the heat exchanger module.

List of reference symbols

1	Side part
2	Marginal region
3	End region
4	Cutout
5, 5′	Edge
6	Cutout
7	Web
8	Predetermined breaking point